



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM J. AILA, JR.
CHAIRPERSON
WILLIAM D. BALFOUR, JR.
SUMNER ERDMAN
LORETTA J. FUDDY, A.C.S.W.,
M.P.H.
NEAL S. FUJIWARA
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIKE, M.D., J.D.

WILLIAM M. TAM
DEPUTY DIRECTOR

STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

April 20, 2011
Honolulu, Hawaii

Application for Stream Channel Alteration Permit for
Streambank Protection and Stabilization
Riverside apartments, 333 Ohai Street, Wailuku River
Hilo, Hawaii, TMK: (3) 2-6-003:009

APPLICANT:

Yogi Kwong Engineers, LLC
1357 Kapiolani Boulevard, Suite 1450
Honolulu, HI 96814

LANDOWNER:

Big Island Housing Foundation (BIHF)
Riverside Community Based Non-Profit Corp.
688 Kinoole Street, Suite 212
Hilo, HI 96720

SUMMARY OF REQUEST:

Application for Stream Channel Alteration Permit (SCAP.2868.8) for Streambank Protection and Stabilization, Riverside Apartments, 333 Ohai Street, Wailuku River in Hilo, Hawaii at TMK: (3) 2-6-003:009.

LOCATION: See Exhibit 1.

BACKGROUND:

Riverside Apartments is a six-story, walkup apartment building with 74 affordable, one, two and three-bedroom rental units on a 1.85 acre site near the mouth of Wailuku River. Sixty-nine (69) units receive U.S. Department of Housing and Urban Development (HUD) project-based Section 8 funding. HUD is no longer issuing project-based subsidies that are attached to apartment units; therefore, this apartment complex is valuable in preserving affordable housing for multifamily households.

Riverside Apartments is owned by the Big Island Housing Foundation (BIHF) Riverside Community Non-Profit Corporation, a 501(c)(3) corporation. Riverside Apartments provides decent, safe and sanitary housing for families whose income levels are at, or below 50% of the median income in the community. The complex is one of three remaining housing complexes in Hilo that has a project-based subsidy. A household who qualifies for housing at the site pays rent that is only 30% of their income. As of

October 26, 2008, Riverside Apartments was occupied by 73 households, including eight elderly residents and sixty-eight (68) children under 18 years old.

On February 2, 2008, a stream bank failure occurred after a heavy rainfall. BIHF notified the Hawaii Civil Defense Agency, and Hawaii County engineers inspected the site. On February 4, 2008, the Hawaii County Department of Public Works (DPW) recommended that BIHF contact a soils engineer to assess the condition of the collapsed embankment. BIHF is currently in the process of selling Riverside Apartments to Urban Housing Communities, LLC (UHC) but must complete the stream bank stabilization and protection before the sale can be completed.

Geotechnical Investigation of Stream Bank Slope Failure:

- September 9, 2008, - UHC issues a request for proposal to Yogi Kwong Engineers, LLC (YKE) to conduct field reconnaissance/exploration, prepare draft/final geotechnical report and cost estimates for construction.
- September 23, 2008, - YKE provides a proposal to UHC for the proposed scope of work.
- September 24, 2008, - UHC issues a Notice to Proceed (NTP) to YKE based on YKE's September 23, 2008 proposal.
- September 29, 2008, - YKE begins field reconnaissance and exploration.
- October 10, 2008, - YKE issues the first project memorandum letter to UHC summarizing the preliminary stability findings and conceptual interim stabilization recommendations based on a system of micropiles. YKE conducts on-going laboratory testing and refines preliminary stability analyses.
- October 28, 2008, - YKE issues the second project memorandum letter to UHC summarizing three stabilization options and recommending a system of micropiles with shotcrete and soil-rock anchor slope stabilization. YKE's construction cost estimates are used for project planning purposes. YKE conducts on-going geotechnical laboratory tests and updated slope stability evaluations.
- December 18, 2008, - YKE issues a draft geotechnical report to UHC.
- February 10, 2011, - YKE issues a final geotechnical report to UHC and BIHF.

BIHF Interim Actions Pending Slope Stabilization:

- November 4, 2008, - BIHF fences the area to limit access near the embankment and relocates rubbish bins away from embankment.
- November 14, 2008, - BIHF diverts rain gutter downspout discharge away from distressed portion of the embankment.
- April 2009, - BIHF establishes resident emergency evacuation procedures.
- BIHF requests for financial assistance:
 - U.S. Army Corps of Engineers, – Army Corp does not perform work on private land.
 - Federal Emergency Management Agency (FEMA), 10/28/08, – Riverside Apartments does not qualify as non-profit agencies that provide “critical service or need,” and is not eligible for FEMA financial assistance.
 - Small Business Administration, – The landslide occurred on February 2, 2008; and the eligibility period for a declared disaster had expired. Consequently, SBA loans were no longer available.
 - Senator Inouye's Office, – BIHF attempts to get BIHF Riverside project included in HUD's Economic Development Initiative (EDI) Special Purpose Grants that is passed by Congress, but there has been no response.
 - Department of Land and Natural Resources, 10/31/08, – Repair or funding the repair of the stream bank is not a DLNR obligation.
 - Hawaii State Legislature, - In 2009, the State announced that funds were not available for programs/services and capital repairs to nonprofits through its annual Grant-in-Aid program.

- Hawaii County Public Works, 10/30/08, - DPW engineer reviews YKE's report and stabilization recommendations and has no objections; however, the County has no responsibility to repair or fund repair of the embankment.
- Hawaii County Council Member, 11/5/08, - BIHF meets with County Council Member, but no funds are available from the County.
- Big Island Resource Conservation & Development, 11/20/08, - BIHF requests funding assistance, but BIRCD does not fund projects. BIRCD can research other funding sources but has no funds available due to budget-cuts.
- U.S. Department of Housing and Urban Development (HUD) Financial Assistance:
 - January 2009, - BIHF contacts HUD in Honolulu and Las Vegas about the collapsed embankment. HUD indicates that anticipated costs are too large to address with HUD emergency funds and would not approve a second mortgage to fund the design and construction of the stream bank stabilization.
 - January 17, 2009, - HUD continues efforts to assist BIHF in locating alternate sources of funding.
 - May 15, 2010, - BIHF informs HUD that BIHF is unable to find alternative sources for funding other than a second mortgage; that property insurance premiums have increased; and that BIHF insurance policy may not be renewed if nothing was done to stabilize the stream bank.
 - May 25, 2010, - HUD views embankment, requests a copy of YKE's geotechnical report, and responds that the project may qualify for HUD rent increases for Capital Improvements. HUD requests that BIHF submit a request for increased rent.
 - June 30, 2010, - HUD approves a short-term loan from First Hawaiian Bank (FHB) to cover the cost of the embankment repairs. BIHF prepares financial records and applies for short term loan that meets HUD requirements.
 - October 13, 2010, - BIHF receives a Loan Commitment Letter from FHB.
 - December 02, 2010, - FHB inspects 10 random units as part of its loan approval process.
 - January 19, 2011, - FHB inspects embankment as part of its loan approval process.
 - February 17, 2011, - HUD approves rent increase needed to obtain a short term loan.
 - March 18, 2011, - BIHF obtains HUD approval and financing through FHB. BIHF closes on short term loan to fund slope protection and stabilization.
 - April 03, 2011: - HUD approve BHIF's rent increase request.

Geotechnical Investigation:

On September 29, 2008, Yogi Kwong Engineers, LLC (YKE) conducted a field exploration of the property to assess the stability of the existing stream bank and develop geotechnical recommendations for remediation measures. The site of the slope failure was surveyed by using rappelling ropes and ladders to access the steep stream bank and two exploratory borings were drilled approximately 36 feet into the ground. YKE conducted geotechnical laboratory tests to evaluate the engineering properties of the soils encountered.

According to YKE, the following factors contributed to the slope failure:

- The stream bank has a very steep slope gradient of approximately 1H:1.5V at the slope failure location. The stream bank becomes nearly vertical in the upper and lower slope areas. The apartment building is located approximately 18 to 19 feet away from the steep stream bank where the slope failure occurred.
- Rock outcrop extends from the stream bed up to an elevation of about (+/-) 28 feet. Soil-like weathered volcanic tuff (soft porous rock) and ash lies above the bedrock up to the top of the stream bank at an elevation of 55 to 56 feet. The natural soils of the very steep slopes are unstable because natural soils have limited long-term strength to support their own weight in tall and nearly vertical slope conditions. See Exhibit 2.
- Heavy overgrown vegetation on the bluff slope have surcharged and gradually destabilized the steep slopes by the weight of the large, tall trees. Although the roots of large trees can provide

some “anchoring” effects, they can be overturned, and decaying roots can become conduits for water to enter the slope and contribute to saturation. The slope failure displaced most of the vegetation on the bluff and left the scarp surface barren of vegetative growth.

- Poor site drainage features that included: (1) a low earth berm along the crest of the bluff and drain pipe connected to rain gutters which contributed to the soil saturation and groundwater seepage flows through the slope. Soil saturation increases the weight of the soil and adds potentially destabilizing forces onto a steep slope. (2) Water seepage through soils can develop water pressure within the pores of the soil which reduces the strength of the soil, and (3) stormwater runoff over the unprotected slope face can contribute to erosion of the exposed soil scarp.

YKE performed a series of slope stability analyses of the existing stream bank under various loading conditions including the existing condition, potentially fully saturated condition, and various seismic conditions that could possibly occur based on regional and seismic considerations. YKE stability analyses indicated that the existing stream bank can become marginally stable under fully saturated conditions, or become unstable under major earthquake conditions. The slope stability analysis also indicated that slope failures may impact and destabilize the adjacent section of the apartment building if slope stabilization measures are not taken. The stability of the existing slope will be reduced further if the existing scarp is subject to erosion from surface water runoff.

Based on YKE’s experience and case histories, a gravity-type retaining wall would commonly be used to protect and stabilize very steep slopes. However, a gravity-type retaining wall would be very difficult to construct at this site because of the 50-foot bluff height, the very steep gradient, limited construction space, and limited access to mobilize heavy construction equipment.

On February 10, 2011, YKE prepared a Final Geotechnical Report, Emergency Stream Bank Bluff Protection and Stabilization, Riverside Apartments, 333 Ohai Street, Hilo, Hawaii for Urban Housing Communities, LLC and BIHF Riverside Community Based Non-Profit Corporation. YKE’s slope stabilization concept is a combination of a series of closely spaced micro-piles* drilled into the underlying bedrock and a reinforced shotcrete** facing tied town with soil anchors to stabilize and protect the adjacent stream bank and slope based on YKE’s geotechnical analysis.

Permitting, Construction Documents and Stabilization Contract:

- November 2010, - BIHF issues a Request for Proposal to YKE for permit, design and construction management services.
- December 18, 2010, - YKE submits a fee proposal to BIHF to prepare construction plans, permits and construction management services.
- January 27, 2011, - BIHF issues a Notice to Proceed (NTP) to YKE to prepare construction plans, permit and construction management services.
- February 2011, - YKE contracts with civil and structural engineering subcontractors and prepares permitting and construction documents.
- February 28, 2011, - BIHF issues contract with Janod, Inc. for slope stabilization and protection. Janod orders specialized micropile materials from mainland vendors.
- March 25, 2011, - Micropile materials are delivered on-site.
- Issuance of a NTP for construction is pending a Special Management Area (SMA) permit application assessment by Hawaii County and a Stream Channel Alteration Permit approval from the Commission.

* Micropiles (also called minipiles) are high-performance, high-capacity, drilled and grouted piles with diameters typically five to twelve inches. Micropiles can extend to depths of 200 feet and can take loads as small as 3 tons or as high as 200 tons.

** Shotcrete is concrete (or sometimes mortar) conveyed through a hose and pneumatically sprayed at high velocity onto a surface.

- Anticipated construction schedule is four to eight weeks from the issuance of the NTP for construction.

DESCRIPTION:

YKE's slope protection and stabilization work includes:

- Two rows of 6.5-inch diameter vertical micropiles parallel to the top of the stream bank at four-foot on-center spacing. The micropiles consist of a high-strength, central reinforcing bars encased in minimum 4,000 pounds per square inch (psi) cement grout with a minimum 6.5 inch outer diameter steel casing. The micropiles will be drilled and embedded at a minimum of six feet into the underlying weathered basalt rock, and the exterior and interior annular space will be fully grouted. See Exhibit 3.
- Battered micropiles behind the micropiles, spaced similarly as the vertical micropiles and installed at an inclination of 1H:1.25V battered away from the stream bank.
- Horizontal soil/rock anchors along the vertical portion of the slide scarp:
 - 16 soil/rock anchors, each approximately 35 feet long installed at elevation 42 feet above MSL.
 - 14 soil/rock anchors, each approximately 20 feet long, installed at elevation 35 feet above MSL.
- Reinforced shotcrete, approximately 6-8 inches thick, for slope protection over the exposed slide scarp. The reinforced shotcrete will be constructed up and over the protected stream bank and be structurally connected to the micropile cap to transfer the pull out capacity of the battered piles to the shotcrete slope protection and protect and stabilize against shallow slope failures in the upper slope area.
- No work on the rock outcropping below elevation 28 feet above MSL.
- Temporary best management practices (BMPs) such as silt fences, debris catchment fences and sand bags along the stream bank to prevent debris from falling into the river.

ANALYSIS:

Agency Review Comments:

The U.S. Army Corps of Engineers (COE) commented that the project is located landward of the Mean High Water Mark (MHWM) and a Department of the Army (DA) permit will not be required.

Hawaii County Planning Department: The subject parcel is in the Special Management Area (SMA) and is subject to review. Due to the emergency nature of the request, the Planning Department will be issuing a SMA Emergency Permit for the proposed emergency stabilization of the stream bank slope.

The U.S. Fish and Wildlife Service, Office of Hawaiian Affairs, Department of Hawaiian Home Lands, Department of Health (DOH) Clean Water Branch (CWB) and University of Hawaii Environmental Center did not submit comments as of the date of preparation of this submittal.

DLNR Review Comments:

- Land Division: The Wailuku River bed and its banks up to the water level of the river are under the State's ownership. A right-of-entry permit is required for any work to be done on the river bank below the water level, or the river bed, including, but not limited, to moorings for the construction platforms or for storing materials necessary for the performance of the stream bank protection and stabilization work.
- State Parks: not subject to its authority or permit.

State Historic Preservation Division (SHPD), Division of Forestry and Wildlife (DOFAW), Division of Aquatic Resources (DAR), and Engineering did not submit comments as of the date of preparation of this submittal.

Chapter 343 Environmental Assessment (EA) Compliance Review:

EA Triggers: In accordance with HRS §343-5 (a), the applicant's proposed action does not trigger the need for an EA because the proposed project is located on private land and will use private funds.

Staff Review

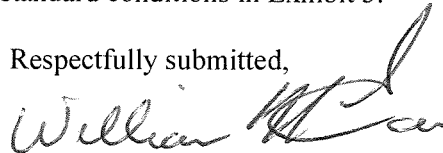
On February 17, 2011, YKE requested an emergency authorization from the Commission for the proposed streambank protection and stabilization work. However, staff requested that YKE apply for a Stream Channel Alteration Permit for the proposed work because of the three-year period from when the slope failure occurred in 2008 to 2011, and does not qualify for "emergency work" as defined in HAR §13-169-55 where immediate but minimal action is required to remove or prevent immediate threats to health and safety or further damage to property.

Wailuku River is a perennial stream with a watershed area of 252.2 square miles and a total stream length of 196.1 miles. Native crustaceans and fish are located in the estuary, middle and upper reaches and headwaters of Wailuku River. No work will occur in Wailuku River or on the rock out-cropping below elevation 28 feet above MSL. The proposed work will occur at and above elevation 35 feet above MSL and on top of the stream bank. Best management practices include the installation of silt fences, debris catchment fences and sand bags along the stream bank to prevent debris from falling into the river. Therefore, staff expects negative impacts to Wailuku Stream to be insignificant.

RECOMMENDATION:

That the Commission approve the applicant's Stream Channel Alteration Permit (SCAP.2868.8) for Streambank Protection and Stabilization, Riverside Apartments, 333 Ohai Street, Wailuku River in Hilo, Hawaii at TMK: (3) 2-6-003:009, subject to the standard conditions in Exhibit 5.

Respectfully submitted,



WILLIAM M. TAM
Deputy Director

- Exhibits:
1. Location Map
 2. Generalized Geologic Profile
 3. Site Plan and Construction Details
 4. Slope Reconnaissance Photos
 5. Standard Stream Channel Alteration Permit Conditions

APPROVED FOR SUBMITTAL:

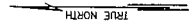


WILLIAM J. AILA, JR.
Chairperson

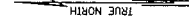
2011 MAR 24 PM 2:13

ENGINEER: SHIGEMURA, LAU, SAKANAHI, HIGUCHI & ASSOC., INC.
1916 Young St., 2nd Floor, Honolulu, HI 96826

SHEET NO.	DRAWING NO.	DESCRIPTION
1	T-1	TITLE SHEET
2	T-2	NOTES
3	T-3	NOTES
4	C-1	EXISTING CONDITIONS
5	C-2	EXISTING CONDITIONS
6	C-3	EROSION CONTROL PLAN
7	T	EROSION CONTROL PLAN DEBRIS CATCHMENT DETAILS
8	S-1	GENERAL NOTES AND SPECIAL DETAILS
9	S-2	GENERAL NOTES AND SPECIAL DETAILS
10	S-3	PILE CAP PLAN AND SHOTCRETE WALL ELEVATION
11	S-4	EMBANKMENT SECTION
12	S-5	SECTIONS AND DETAILS
13	S-6	SOIL NAIL ANCHOR DETAILS
14	B-1	GENERALIZED GEOLOGIC PROFILE
15	B-2	GENERALIZED GEOLOGIC PROFILE

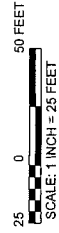


NOT TO SCALE



FILE ID: 2AP.2868.0
DOC ID: 7603v

Date _____



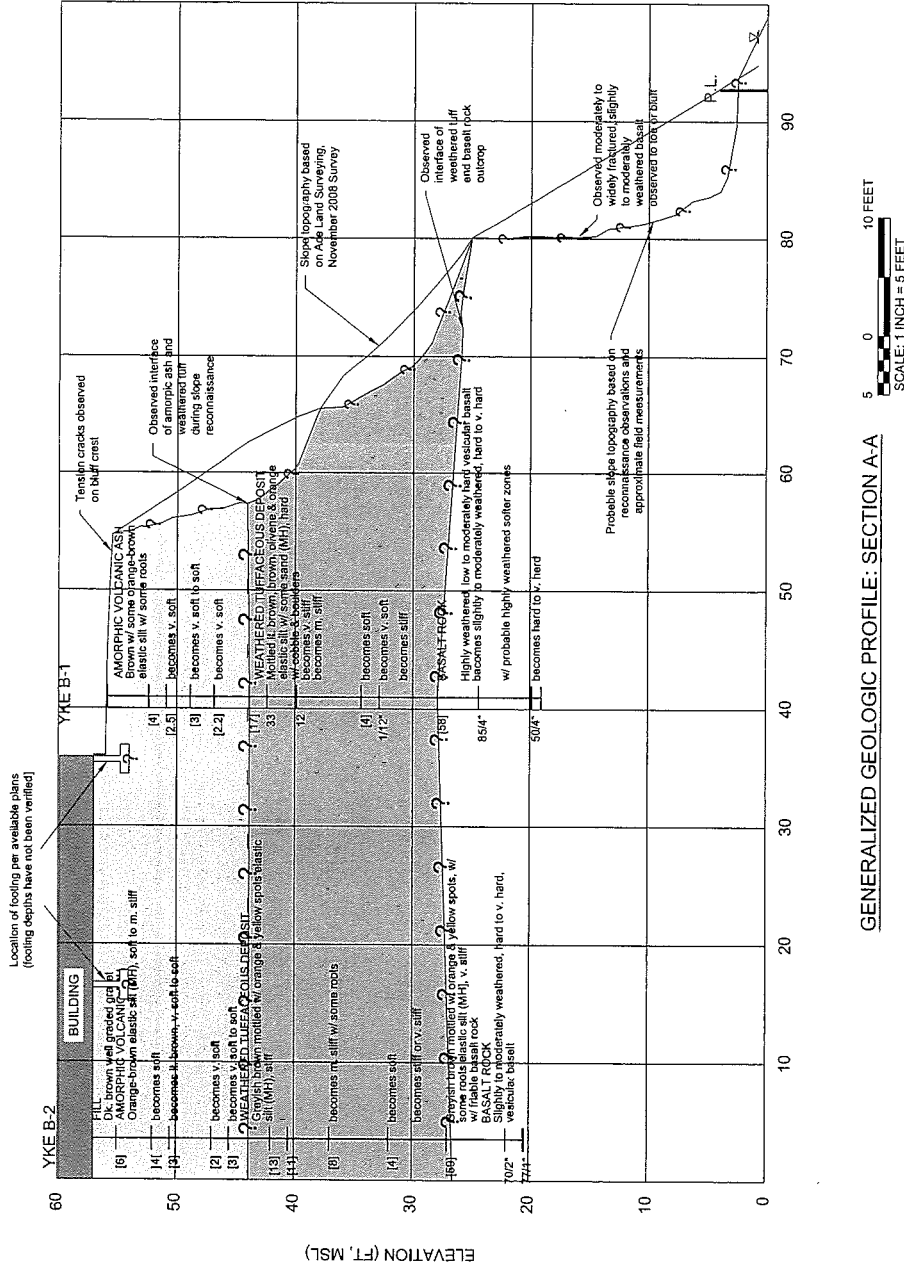
EXISTING CONDITIONS

1. PHOTOS TAKEN SEPTEMBER 2008

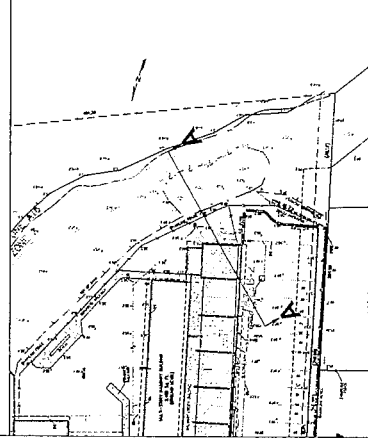
EMERGENCY STREAM BANK BLUFF SLOPE PROTECTION AND STABILIZATION INVESTMENT APARTMENTS # 1330 MAIN STREET, H.L.O. INMAN COUNTY (UNIT # 10000000)	EXISTING CONDITIONS				DRAWING NO. E-1
	APPROVED BY	DATE	SCALE	AS SHOWN	
SHEET TITLE:	Yogi Kwong Engineers, LLC				
DESIGNED:	NS	APPROVED BY	DATE	SCALE	AS SHOWN
DRAWN:	MS		March 24, 2014		
CHECKED:	JK				

SHEET 4 OF 15

1. THIS FIGURE IS ONLY INTENDED TO SHOW THE GENERALIZED GEOLOGIC CONDITIONS. SEE GEOTECHNICAL REPORT FOR MORE INFORMATION.
2. SUBSURFACE GROUND CONDITIONS WILL VARY OVER SHORT DISTANCES AND BETWEEN BORINGS. GEOLOGIC DESCRIPTIONS ARE GENERALIZED AND VARY FROM THOSE INDICATED. UTILITY TRENCHES AND BACKFILLS ARE NOT SHOWN IN THIS FIGURE, AND ARE PRESENT ALONG ALL UNDERGROUND UTILITY ALIGNMENTS.
3. WE UNDERSTAND THAT THE SURVEY POINTS ALONG THE STREAM BANK SLOPE WERE LIMITED DUE TO VERY STEEP SLOPE AREAS THAT WERE INACCESSIBLE TO



GENERALIZED GEOLOGIC PROFILE: SECTION A-A

[illegible]

EMERGENCY STREAM BANK BLUFF SLOPE
PROTECTION AND STABILIZATION
OVERVIEW APARTMENTS AT 333 OHAI STREET, HILO, HAWAII COUNTY
(TASK 2-6-0037009)

GENERALIZED GEOLOGIC PROFILE

100

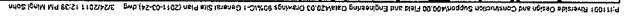
Yogi Kwong Engineers, LLC

US	DATE: March 24, 2011
----	----------------------

SHEET 133HS

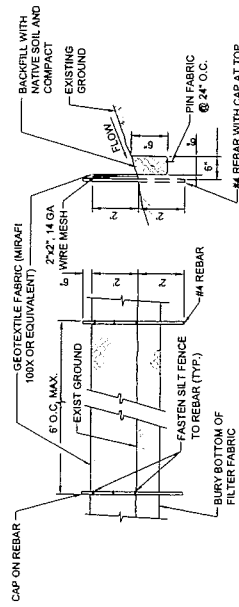
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841

EXHIBIT 2





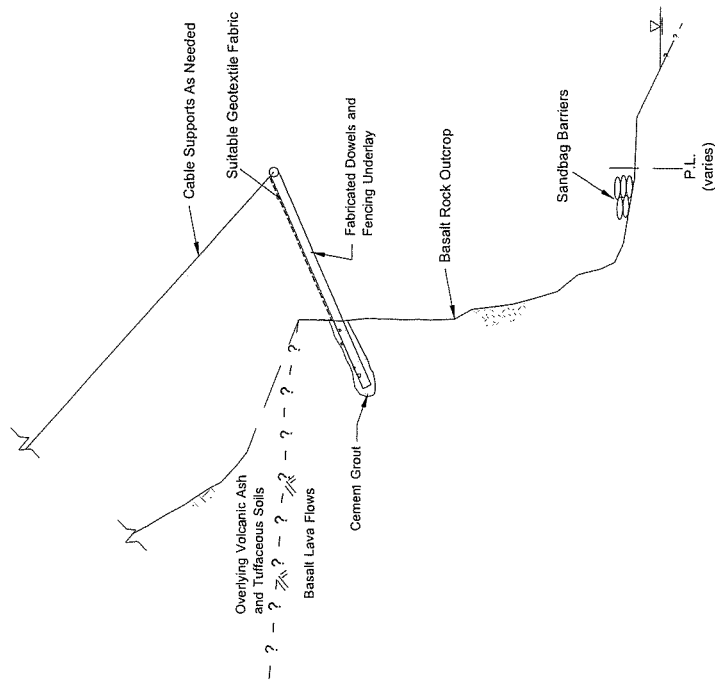
VERTICAL MICROPILE
BATTERED MICROPILE (1/2V/1H)
ROCK ANCHOR INSTALLED AT ELEVATION
35 FEET MSL
ROCK ANCHOR INSTALLED AT ELEVATION
42 FEET MSL
APPROXIMATE LIMITS OF REINFORCED
SHOTCRETE SLOPE PROTECTION TO BE
FIELD VERIFIED AND DETERMINED BY THE
ENGINEER
APPROXIMATE TOP OF NEAR VERTICAL
ROCK OUTCROP OBSERVED AT TOE OF SLIP
SCARP
DIRECTION OF ROCK ANCHOR
SILT FENCE
DEBRIS CONTAINMENT BARRIER WITH
GEOTEXTILE (FOR DETAILS SEE SHEET C-3)



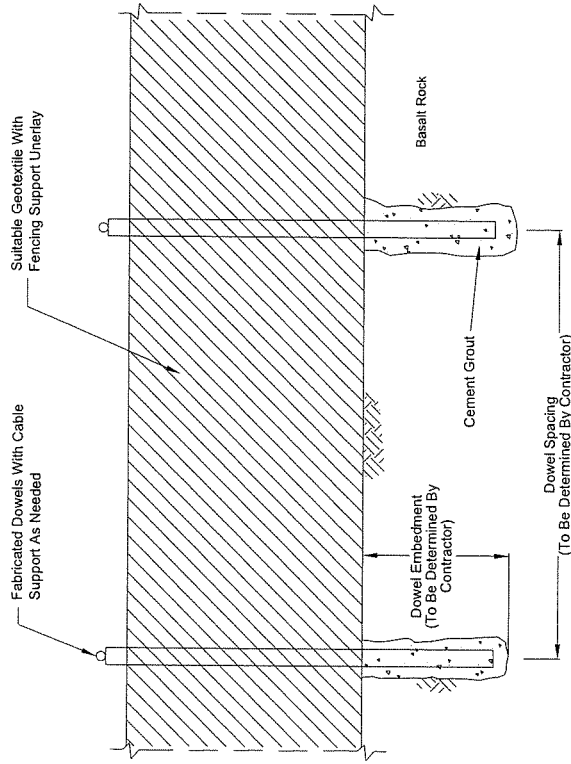
TYPICAL SILT FENCE DETAIL FOR SOIL SUBGRADE

[illegible]

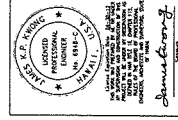
EROSION CONTROL PLAN



TYPICAL DEBRIS CATCHMENT SECTION
NOT TO SCALE



DEBRIS CATCHMENT DETAIL
NOT TO SCALE



EMERGENCY STREAM BANK BLUFF SLOPE
PROTECTION AND STABILIZATION
RIVERSIDE APARTMENTS AT 333 OHA STREET, HILO, HAWAII COUNTY
(TMK 2-6-003-009)

EROSION CONTROL PLAN DETAILS

Yogi Kwong Engineers, LLC

DESIGNED BY: YK

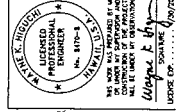
APPROVED BY: YK

DATE: April 7, 2011

SCALE: As Shown

C-3

NOTE:
1. SANDBAG SILT CONTAINMENT TO BE MAINTAIN WITHIN
PROPERTY BOUNDARIES OF TMK (2) 6-003-009



EMERGENCY STREAM BANK BLUFF SLOPE
PROTECTION AND STABILIZATION
REVERSADE APARTMENTS AT 333 OHAI STREET, HILO, HAWAII COUNTY
(TMK: 2-4-007-009)

DESIGNED:		WH	APPROVED BY:	DRAWING NO. S-2
DRAUGHT:		UM	DATE:	
CHECKED:		WH	SCALE: As Shown	

SHEET 9 OF 15





Torevane Test Performed in Exposed Ash On Upper Slope Face



Reconnaissance Standing Near the Toe of the Slide



Exposed Ash Soil Along Upper Slide Face (Western End of Head Scarp)



Exposed Ash Soil Along Upper Slide Face (Center of Head Scarp)

SLOPE RECONNAISSANCE

Riverside Apartments Stream Bank Assessment
333 Ohai Street, Hilo, Hawaii

Project No. 08029

YKE
Yogi Kwong Engineers, LLC
APPENDIX C-3



Exposed Ash Soil Along Upper Slide Face (Eastern End of Head Scarp)



Exposed Ash Soil Along Mid to Upper Slide Face



Exposed Ash Soil Along Upper Slide Face (Western Edge of Slide)



Eastern Edge of Slide Near Midslope

SLOPE RECONNAISSANCE

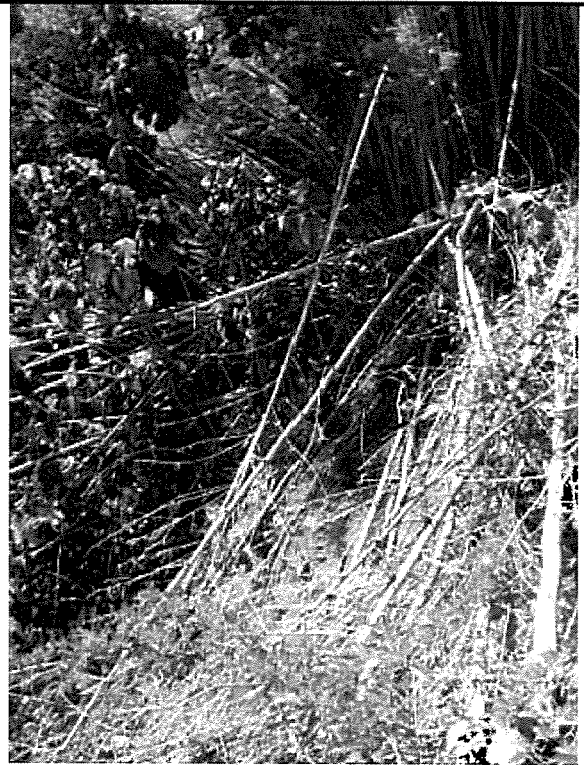
Riverside Apartments Stream Bank Assessment
333 Ohai Street, Hilo, Hawaii

Project No. 08029

YKE
Yogi Kwong Engineers, LLC
APPENDIX C-4



Weathered Tuff along Midslope



Eastern Edge of Slide Scarp (Midslope)



Reconnaissance Standing Near the Toe of the Slide



Rock Interface Observed at/below the Toe of the Slide

SLOPE RECONNAISSANCE

Riverside Apartments Stream Bank Assessment
333 Ohai Street, Hilo, Hawaii

Project No. 08029

YKE
Yogi Kwong Engineers, LLC
APPENDIX C-5

STANDARD STREAM CHANNEL ALTERATION PERMIT CONDITIONS
(Revised 9/19/07)

1. The permit application and staff submittal approved by the Commission at its meeting on April 20, 2011, shall be incorporated herein by reference.
2. The applicant shall comply with all other applicable statutes, ordinances, and regulations of the Federal, State and county governments.
3. The applicant, his successors, assigns, officers, employees, contractors, agents, and representatives, shall indemnify, defend, and hold the State of Hawaii harmless from and against any claim or demand for loss, liability, or damage including claims for property damage, personal injury, or death arising out of any act or omission of the applicant or his successors, assigns, officers, employees, contractors, and agents under this permit or related to the granting of this permit.
4. The applicant shall notify the Commission, by letter, of the actual dates of project initiation and completion. The applicant shall submit a set of as-built plans and photos of the completed work to the Commission upon completion of this project. This permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The proposed work under this stream channel alteration permit shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.
5. Before proceeding with any work authorized by the Commission, the applicant shall submit one set of construction plans and specifications to determine consistency with the conditions of the permit and the declarations set forth in the permit application.
6. The applicant shall develop site-specific, construction best management practices (BMPs) that are designed, implemented, operated, and maintained by the applicant and its contractor to properly isolate and confine construction activities and to contain and prevent any potential pollutant(s) discharges from adversely impacting state waters. BMPs shall control erosion and dust during construction and schedule construction activities during periods of low stream flow.
7. The applicant shall protect and preserve the natural character of the stream bank and stream bed to the greatest extent possible. The applicant shall plant or cover lands denuded of vegetation as quickly as possible to prevent erosion and use native plant species common to riparian environments to improve the habitat quality of the stream environment.
8. In the event that subsurface cultural remains such as artifacts, burials or deposits of shells or charcoal are encountered during excavation work, the applicant shall stop work in the area of the find and contact the Department's Historic Preservation Division immediately. Work may commence only after written concurrence by the State Historic Preservation Division.